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IS 3623 (1978): Guide and Rubbing Ropes [MED 10: Wire Ropes and Wire Products]

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"Knowledge is such a treasure which cannot be stolen"

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AMENDMENT NO. 1 NOVEMBER 1983
TO
IS:3623-1978 SPECIFICATION FOR GUIDE AND RUBBING ROPES

(First Revision)

Alterations

(*Page 1, clause 4.1, first sentence*) - Substitute the following for the existing sentence:

'The wire or rod used in the manufacture of guide and rubbing ropes shall be cold drawn and shall be from steel made by open hearth or electric process or any of the oxygen blown processes.'

(EDC 32)

Reprography Unit, BIS, New Delhi, India

UDC 677·721 : 622·674

(First Reprint AUGUST 1988)

REAFFIRMED
200

Indian Standard

SPECIFICATION FOR GUIDE AND RUBBING ROPES

(First Revision)

Wire Ropes and Wire Products Sectional Committee, EDC 32; Wire Products (Other than Wire Ropes) Subcommittee, EDC 32 : 3 [Ref · Doc : EDC 32 (2784)]

1. Scope — Covers requirements for round rod and half-locked coil guide and rubbing ropes.

2. Terminology — *See* IS : 2363-1965 'Glossary of terms relating to wire ropes'.

3. Dimensions

3.1 *Size* — The size of the rope shall be expressed in terms of nominal diameter and it shall be one of those diameters given in Tables 1 and 2. The actual diameter shall be within $^{+4}_{-2}$ percent of the nominal diameter.

3.2 *Length* — The rope shall not be less than the length specified by the purchaser nor shall it exceed the specified length by more than 2·5 percent.

4. Material

4.1 The wire or rod used in the manufacture of guide and rubbing ropes shall be from steel made by open hearth or electric process or any of the oxygen blown processes. Phosphorus and sulphur content of the steel shall not be more than 0·05 percent and in addition, in the case of oxygen blown process steels, the nitrogen content shall not be more than 0·008 percent. Rimming steel shall not be used in the manufacture of wires or rods.

4.2 The tensile strength of the rods from which the round rod guide and rubbing ropes are made, shall be from 350-500 N/mm². The tensile strength range of the wires of a locked coil guide and rubbing rope shall be any one of the following:

a) 700-900 N/mm²; and

b) 800-950 N/mm².

TABLE 1 ROUND ROD GUIDE ROPES — DIAMETERS, MASSES AND BREAKING LOADS

(*Clauses* 3.1, 5 *and* 9.2)

Nominal Diameter of Rope mm	Mass kg/100 m ±4%	Minimum Breaking Load kN
19	189	90
22	253	119
25	327	152
29	414	196
32	512	240
35	619	282
38	737	347

Adopted 24 July 1978

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Gr 4

BUREAU OF INDIAN STANDARDS
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TABLE 2 HALF-LOCKED COIL GUIDE AND RUBBING ROPES — DIAMETERS, MASSES AND BREAKING LOADS

(*Clauses* 3.1, 5 *and* 9.2)

Nominal Diameter of Rope mm	Mass kg/100 m ±4%	Minimum Breaking Load kN	
		Wire 700-900 N/mm^2	Wire 800-950 N/mm^2
29	456	319	386
32	558	387	473
35	711	473	580
38	840	560	686
41	977	666	811
44	1 125	772	937
48	1 339	879	1 081
50	1 453	1 004	1 229
54	1 696	1 159	1 419

4.3 The rod or wire may be supplied in any one of the following conditions as specified by the purchaser:

a) Ungalvanized, and
b) Galvanized.

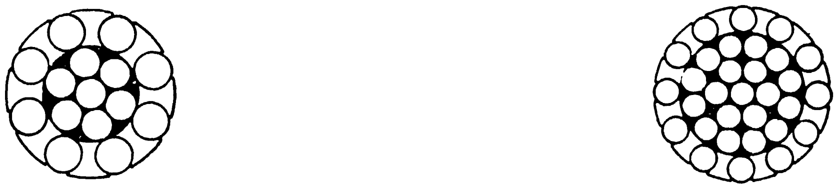
If galvanized rod or wire is required, the minimum mass of the coating on the wire shall be 45 g/m^2 of surface area for the shaped wire and 65 g/m^2 for the round rod or wire.

5. Breaking Load and Mass — Shall be as given in Tables 1 and 2.

6. Construction

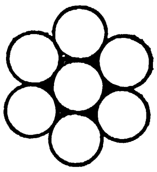
6.1 Guide and rubbing ropes made of round wires or rods shall be of 6 over 1 type of construction (*see* Fig. 1).

6.2 Half-locked coil guide and rubbing ropes shall be constructed with an outer layer of a combination of shaped and round wires followed by a further wire layer or layers of round wires. The size of the core shall be sufficient to give adequate support to the outer layer (*see* Fig. 1).



Half-Lock Wires Over an Inner Layer of Round Wires   Half-Lock Wires Over Layers of Round Wire

Half-Locked Coil Guides



7 Rods (6-1)
Round Rod Guides

FIG. 1 GUIDE AND RUBBING ROPES

6.2.1 The direction of the outer layer shall be opposite to that of core.

6.3 The manufacturer shall make available to the purchaser the details of construction on request. The length of lay shall not be more than 15 times the nominal diameter of the rope.

7. General Requirements

7.1 *Workmanship* — The completed rope shall be free from defects, kinks, loose wires and other irregularities and shall remain in this position when unwound from a reel or a coil provided due precautions are taken and the ends are effectively secured.

7.2 *Joints* — The joints in rods or wires shall be avoided as far as possible, but when they are necessitated by the length of the rope, they shall be distributed as widely as possible and in no case more than one wire shall be joined in any length of 10 m of the rope. The joints shall be either brazed or electrically welded. If the joint is brazed, it shall be properly scared, if welded, it shall be properly annealed. Any wire in the rope shall not contain more than one joint over a rope length of 100 m.

7.3 *Lubrication* — The rope shall be thoroughly lubricated internally and externally during the course of manufacture. The lubricant shall meet the requirement laid down in IS : 6594-1977 'Technical supply conditions for steel wire ropes and strands (*first revision*)'.

8. Test on Wires or Rod Used by the Rope Manufacturer

8.1 *Round Wire/Rod Ropes* — Each coil or length of rod used in the manufacture of rope shall be subjected to a tensile and reverse bend test. The results shall be recorded and shall be available for inspection by the purchaser or his representative at the rope manufacturer's works.

8.2 *Locked Coil Ropes* — Each coil or length of wire used in the manufacture of the rope shall be subjected to tensile and reverse bend tests. The test results shall be recorded and shall be made available for inspection by the purchaser or his representative at the rope manufacturer's works. The test shall be carried out as follows.

8.2.1 *Tensile test* — The tensile test shall be carried out in accordance with the method laid down in IS : 1835-1976 'Specification for round steel wire for ropes (*third revision*)' except that in the case of shaped wires, the tensile strength shall be calculated from the breaking load and the 'equivalent round section' that is, the round wire of equal cross sectional area to that of the shaped wire (*see* Appendix A). The equivalent round section for the particular wire shall be provided by the manufacturer, on request.

8.2.2 *Reverse bend test* — Reverse bend test shall be done for round and shaped wire in accordance with IS : 1835-1976. In case of shaped wire, the wire shall be placed in the bending machine with the waist facing the mandrel, that is, the shaped wire shall be bent over the waist (*see* Fig. 2). The values obtained shall not be less than those specified in Tables 3 and 4.

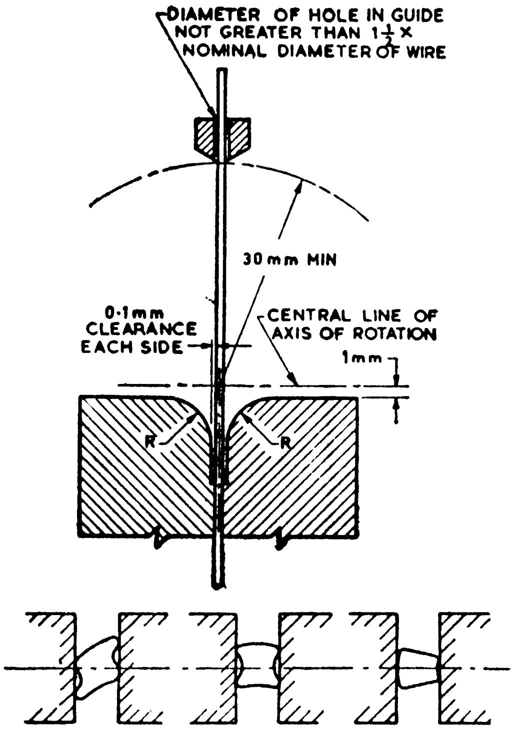

DIAMETER OF HOLE IN GUIDE NOT GREATER THAN 1½ x NOMINAL DIAMETER OF WIRE
30 mm MIN
0·1 mm CLEARANCE EACH SIDE
CENTRAL LINE OF AXIS OF ROTATION
1 mm
R
R

FIG. 2 BEND TEST

TABLE 3 REVERSE BEND TEST FOR ROUND WIRE — UNGALVANIZED AND GALVANIZED BEFORE ROPE MAKING

(*Clause* 8.2.2)

Nominal Diameter of Wire mm		Diameter of the Bending Roller mm	Minimum Number of Bends	
Over	Up to and Including		Ungalvanized	Galvanized
4·4	5·1	20	6	5
5·1	5·7	30	6	5
5·7	6·6	30	5	4
6·6	8·1	40	5	4
8·1	8·7	40	4	3
8·7	9·2	40	3	2
9·2	9·9	40	2	1½
9·9	10·7	40	1	½

TABLE 4 REVERSE BEND TEST FOR SHAPED WIRE — UNGALVANIZED AND GALVANIZED BEFORE ROPE MAKING

(*Clause* 8.2.2)

Nominal Altitude mm		Diameter of the Bending Roller mm	Minimum Number of Bends			
			Broad Section*		Narrow Section†	
Over	Up to and Including		Ungalvanized	Galvanized	Ungalvanized	Galvanized
5·0	5·7	25	4	3	5	4
5·7	6·4	30	5	4	6	5
6·4	7·0	30	4	3	5	4
7·0	7·6	30	3	3	4	3
7·6	8·3	40	5	4	6	5
8·3	8·9	40	5	4	6	3
8·9	9·5	40	4	3	5	4

*Ratio of nominal altitude and minimum waist measurement ≯ 1·9 : 1.

†Ratio of nominal altitude and minimum waist measurement > 1·9 : 1.

9. Tests on Completed Wire Ropes

9.0 When specified by the purchaser, inspection and testing of completed wire ropes and wires from a completed rope shall be carried out at the works of the rope manufacturer unless otherwise agreed to between the manufacturer and the purchaser. The manufacturer shall supply all the necessary test samples, machinery, apparatus and the labour required for inspection and testing at his works. All the tests shall be carried out under the direction of the purchaser or his representatives.

The tests to be carried out shall be:

a) the tensile test on wires taken from the sample of the completed rope, and

b) the breaking load test.

9.1 *Test on Wires from the Completed Rope* — A suitable length from the manufactured rope shall be cut. The wires of each layer shall be separated and wires of each type and size shall then be separated into groups and the wires in each group well mixed together. A quarter of each group shall then be subjected to a tensile test in accordance with the procedure laid down in **8.2.1**.

9.1.1 The tensile strength of the wires removed from the completed rope shall not be more than 50 N/mm^2 below the minimum value of the tensile range nor shall it exceed the maximum value of the tensile range by 80 N/mm^2. The difference in tensile strength between the maximum and minimum tensile strength values of wires tested shall not exceed 240 N/mm^2.

9.1.2 *Retests* — If two or more wires fail to pass the tensile test specified retests shall be carried out. If under the retests, two or more wires fail, the rope represented by the sample shall be considered not to comply with this specification.

9.2 *Breaking Load Test* — The rope shall be tested to destruction in accordance with the method specified in IS : 6594-1977. The breaking strength of the rope, when tested to destruction, shall not be less than the values specified in Tables 1 and 2.

10. Independent Tests on Completed Rope

10.1 If the purchaser is not satisfied with the tests, the manufacturer shall be at liberty to have independent tests carried out by a testing authority to be agreed upon between the purchaser and the manufacturer, and if the results of these tests are satisfactory the rope shall be deemed to comply with the specification.

10.2 Such independent tests shall be carried out in accordance with the provisions of this standard.

11. Certificate of Compliance — With each reel of the completed rope, the manufacturer shall supply a certificate of test. The form of the certificate should be as indicated in Appendix C of IS : 6594-1977.

12. Marking — The order number of the purchaser and any other marking, as may be specified by the purchaser, shall be legibly stamped upon a tag securely attached to each reel or coil.

12.1 *Certification Marking* — Details available with the Bureau of Indian Standards.

13. Packing — All ropes shall be supplied on reels unless specified by the purchaser to be in coils and shall be suitably protected to avoid damage in transit. The reels shall be substantially round and care shall be taken that no permanent set occurs in the rope wound on the reel.

APPENDIX A

(*Clause* 8.2.1)

METHOD OF CALCULATING EQUIVALENT ROUND SECTION FROM SHAPED WIRE

A-1. Prepare an exact length of 150 mm wire, with ends filed flat, clean and weigh accurately.

Then

Area in mm^2 $= \text{mass in grams} \times 0{\cdot}85$

Diameter of equivalent round section in mm $= \sqrt{\text{mass in grams} \times 1{\cdot}081}$

APPENDIX B

(*Explanatory Note*)

INFORMATION TO BE GIVEN WHERE NECESSARY WITH ENQUIRY OR ORDER

B-0. The following information shall be given where necessary with the enquiry or order.

B-1. Particulars of shaft:

a) Depth;
b) Whether upcast or downcast;
c) Whether wet or dry, and approximate range of temperature variation; and
d) Whether there are any other special circumstances likely to affect the rope.

B-2. Reel or coil dimensions (maximum overall diameter and width).

B-3. Particulars of rope required or proposed:

a) Length in metres,
b) Nominal diameter,
c) Minimum breaking load in kN,
d) Whether the rod or wire is to be galvanized or not,
e) Total mass of tension weights attached to rope,
f) Method of fastening rope to weights, and
g) Type of headgear suspension.

B-4. Particulars of inspection and testing required.

APPENDIX C

(*Explanatory Note*)

INFORMATION TO BE GIVEN BY THE MANUFACTURER, IF REQUIRED

The following information is to be given by the manufacturer, if requested:

a) Quality of material and tensile strength of the rods, or wires;
b) Nominal diameter of rope; and

c) Details of construction:

Number and diameter of rods in case of round rod ropes and in case of the locked coil rope:

1) Number and size of round and shaped wires in outer layer,
2) Number and diameter of round wires in other layers, and
3) Equivalent round section of shaped wires;

d) Nominal mass in kg/100 m of rope;

e) Maximum breaking load of rope in kN; and

f) Approximate mass of rope as packed for transit.

EXPLANATORY NOTE

This standard was first issued in 1966. The experience gained in the implementation of this standard since its revision necessitated the present revision. Tables 1 and 2 have been revised. The nominal diameters 41 to 51 mm and 19 to 25 mm have been deleted from Tables 1 and 2 respectively because these sizes were not popular. In view of the deletion of nominal diameters of 41 to 51 mm from Table 1, the 6, 8 or 9 outer rod construction over 7 smaller rods have been deleted in case of round rod guide ropes. Besides this, the values have been given in SI units.

Particulars regarding the information to be supplied by the purchaser with the enquiry or order and by the manufacturer with supply are given in Appendices B and C respectively.

Guide ropes are extensively used in mining shafts up to 1 000 metres in depth, rigid guides being used in deeper shafts. Guide ropes are suspended from the pit head frame and at the pit-bottom either tensioning weights are hung or the guide ropes are suitably clamped. Rubbing ropes are special guide ropes provided between the cages in deep shaft or in shafts where clearances are small.

Both round rod construction as well as half-locked coil construction are used for guide ropes. Of these, the round rod construction is generally composed of round steel rods up to 13 mm in diameter, laid 6 over 1. Locked coil ropes are, however, favoured because they have a smooth and larger wearing surface and offer a greater resistance to corrosion as it is not so easy for water to enter the interstices between the wires.

While preparing this standard assistance has been derived from NCB Specification 388/1970 ' Half-locked coil guide locks ' issued by National Coal Board, UK.